

CLAIMS

What is claimed is:

- 5 1. A method of measuring line profile asymmetries in microelectronic devices, the method comprising the steps of:
- directing light at an array of microelectronic features of a microelectronic device;
- detecting light scattered back from the array comprising one or more features
- selected from the group consisting of one or more angles of reflection and one or more wavelengths; and
- 10 comparing one or more characteristics of the back-scattered light by performing
- an operation selected from the group consisting of examining data from complementary angles of reflection and performing a model comparison.
2. The method of claim 1 wherein the directing step comprises directing light at substantially
- 15 a single wavelength.
3. The method of claim 1 wherein the directing step comprises directing light at a plurality of
- wavelengths.
- 20 4. The method of claim 1 wherein the comparing step comprises comparing light intensity.
5. The method of claim 1 wherein the comparing step additionally comprises comparing
- phase.
- 25 6. The method of claim 1 wherein the comparing step additionally comprises comparing
- ratios of light magnitude and light phase.

7. The method of claims 1, 2 or 3 wherein the directing step comprises directing light at an array of microelectronic features in general conical configuration.

8. The method of claims 1, 2 or 3 wherein the directing and detecting steps are performed
5 by an angular scatterometer.

9. The method of claims 1, 2 or 3 wherein the directing and detecting steps are performed by a spectral scatterometer.

10. The method of claims 1, 2 or 3 wherein the comparing step comprises decomposing
10 back-scattered light into S and P components relative to a plane of incidence.

11. The method of claims 1, 2 or 3 wherein the detecting step comprises detecting specular
order diffracted light.

12. The method of claims 1, 2 or 3 additionally comprising the step of employing the results
15 of the comparing step to detect asymmetries selected from the group consisting of asymmetries within a single layer of the microelectronic device and asymmetries within multiple layers of the microelectronic device.

20 13. The method of claims 12 additionally comprising the step of controlling a manufacturing process if results of the comparing step indicate an asymmetry in the array.

14. An apparatus for measuring line profile asymmetries in microelectronic devices, said apparatus comprising:

means for directing light at an array of microelectronic features of a microelectronic device;

5 means for detecting light scattered back from the array comprising one or more features selected from the group consisting of one or more angles of reflection and one or more wavelengths; and

means for comparing one or more characteristics of the back-scattered light by performing an operation selected from the group consisting of examining data from complementary angles of reflection and performing a model comparison.

15. The apparatus of claim 14 wherein said directing means comprises means for directing light at substantially a single wavelength.

16. The apparatus of claim 14 wherein said directing means comprises means for directing light at a plurality of wavelengths.

17. The apparatus of claim 14 wherein said comparing means additionally comprises means for comparing light intensity.

18. The apparatus of claim 14 wherein said comparing means additionally comprises means for comparing phase.

19. The apparatus of claim 14 wherein said comparing means additionally comprises means for comparing ratios of light magnitude and light phase.

20. The apparatus of claims 14, 15 or 16 wherein said directing means comprises means for directing light at an array of microelectronic features in general conical configuration.

21. The apparatus of claims 14, 15 or 16 wherein said directing and detecting means comprise an angular scatterometer.

22. The apparatus of claims 14, 15 or 16 wherein said directing and detecting means
5 comprise a spectral scatterometer.

23. The apparatus of claims 14, 15 or 16 wherein said comparing means comprises means for decomposing back-scattered light into S and P components relative to a plane of incidence.

10 24. The apparatus of claims 14, 15 or 16 wherein said detecting means comprises means for detecting specular order diffracted light.

25. The apparatus of claims 14, 15 or 16 additionally comprising means for employing the results of the comparing step to detect asymmetries selected from the group consisting of asymmetries
15 within a single layer of the microelectronic device and asymmetries within multiple layers of the microelectronic device.

26. The apparatus of claims 25 additionally comprising means for controlling a manufacturing process if said comparing means indicates an asymmetry in the array.